

Five Social Groups, Explored through Networks

Patrick Manning, draft (2024)

The five social groups explored here emerged at various times: as early as 400,000 years ago and as late as 10,000 years ago. These types of groups were selected as socially important and susceptible to modeling. I have assumed basic demographic and geographic parameters for local human populations. Communities had 150 members each, of whom 90 were adults over 20. I assume life expectation of just over 20 years, with the associated age pyramids (10% infants under 5; 30% ages 6-18; 45% 19-44; 15% over 44). Populations are assumed to have reproduced themselves without growth.

Geographically, the 150 members of a community are assumed to have lived at a density of one person per square kilometer within a range of 150 km².¹ Simplifying for purposes of illustration, I assume that each adult had as many as 9 network links to their own children and other adults, allocated among nodes as described below.²

Informal groups. Informal groups, also known as I-groups, reflect non-networked behavior. They do not have to be structured to exist. Informal groups of people assemble without a specified group purpose and without qualifications for admission, through individual objectives of group members may be mutually consistent; members may be able

¹ The community's range is a circle with a radius of about 7 km, in which each of 30 households of 5 members ranged across a territory equal to 2.25 km on each side of a square. These demographic and geographic parameters are illustrative only and can be revised as research gives clearer ideas on past realities. Manning 2023a.

² Dunbar (2020) estimates 13-15 links per person.

to act together in response to stimuli from the environment.³ Such informal groups are classified as sets since they lack links among nodes.

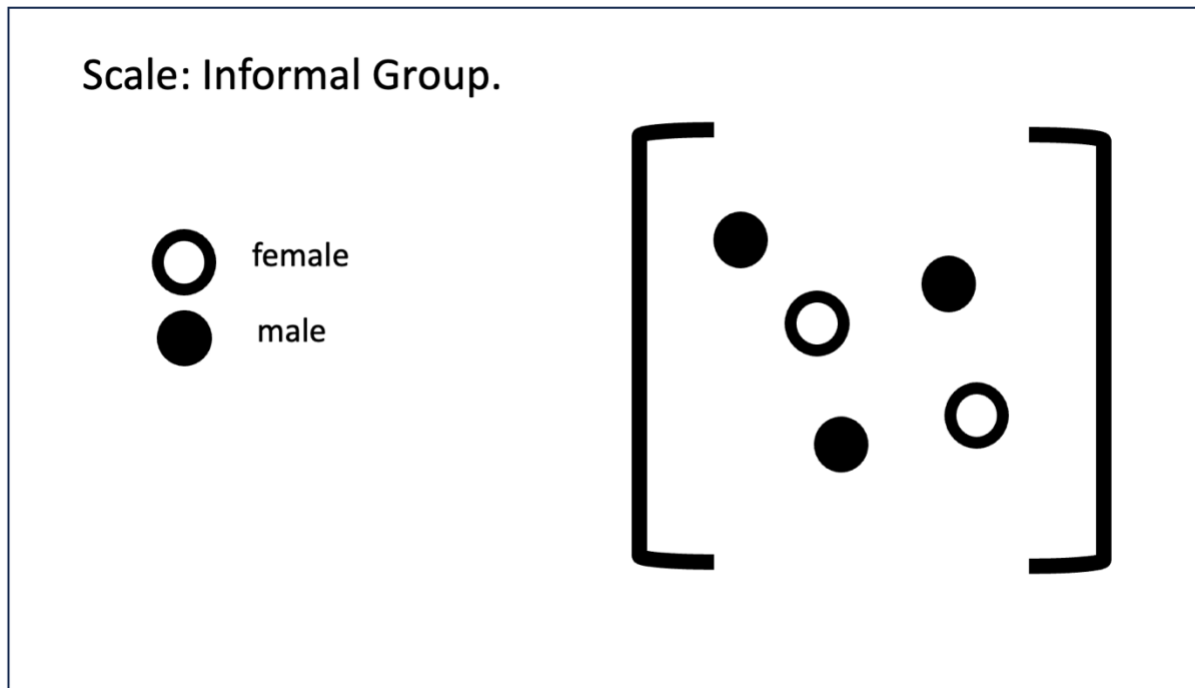


Figure 1. Informal group or I-group.

Figure 1 shows an informal group – indicated with braces [] – including five persons, three males (black) and two females (white). This model places them arbitrarily in two dimensions, showing their dispersion without links. Informal groups are assumed to exist for a short duration, as with people collecting wood, migrant groups, or youths at play. Tuomela defines these as *I-groups*, in that the consciousness of each individual remains separate.⁴ In a networked society, people participated at various times in multiple groups,

³ On I-groups, see Tuomela 2013 and Manning 2020, 166–167.

⁴ Tuomela 2013.

both networked and informal, that were independent of each other. Thus, the individuals shown as an informal group in Figure 1 must also have had networks for other purposes.

Households. The intimate and residential life of humans has centered on two types of groups. Most prominent is that of pair-bonded households, in which a male and female had a tight relationship, nurturing their offspring and perhaps including a sibling or parent of the couple, with an average of five household members. The household developed and long persisted among non-speaking humans. This unit was for eating, sleeping, rest, and nurture of offspring. A second intimate group, not illustrated here, was polygynous, with two to four females raising their offspring under the dominance of a male head of the group, with the groups including some siblings or parents of the leading female. Membership in polygynous units averaged ten persons. It has been shown that polygynous groups existed first: pair-bonded households emerged later and proved themselves to be more efficient.⁵

⁵ Chapais 2008, Gavrilets 2012, Manning 2023b.

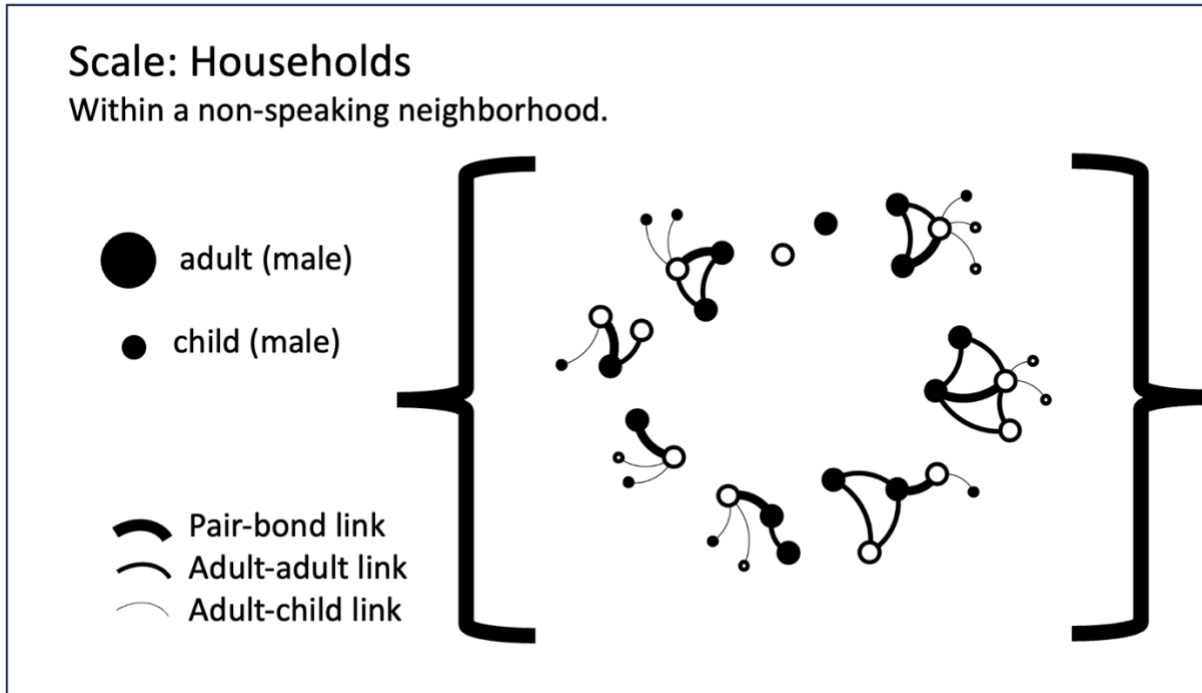


Figure 2. Households (pair-bonded intimate groups) in a Neighborhood.

Figure 2 displays a neighborhood – indicated by braces { } – within a non-speaking community, containing seven contiguous pair-bonded households for a total of 37 persons, with 24 adults and an average of 5 persons (3 adults) per household. The nodes included pair-linked adult males and females; children linked to parents; other adults in households (siblings or parents of the pair); and isolated males and females. Figure 2 shows links only within households; additional networks are explored in Figure 3.

Community. Based especially on the work of Robin Dunbar, it is assumed that community groups of up to 150 members existed for early *Homo sapiens*.⁶ Emergence of the Middle Stone Age, ca. 300,000 years ago, brought important technical advances (e.g.

⁶ Preceding species had slightly smaller communities. Gowlett, Gamble, and Dunbar 2012.

full control of fire, advances in stone technology, elements of material culture) but no speech. As noted above, if each adult human individual had links to about nine others, these could be modeled in various ways. Assuming communication by basic gestures, elementary vocal expressions, and eye communication, links might have formed between friends and family members. Certain senior individuals might have had unusually large numbers of links.⁷ The community, because

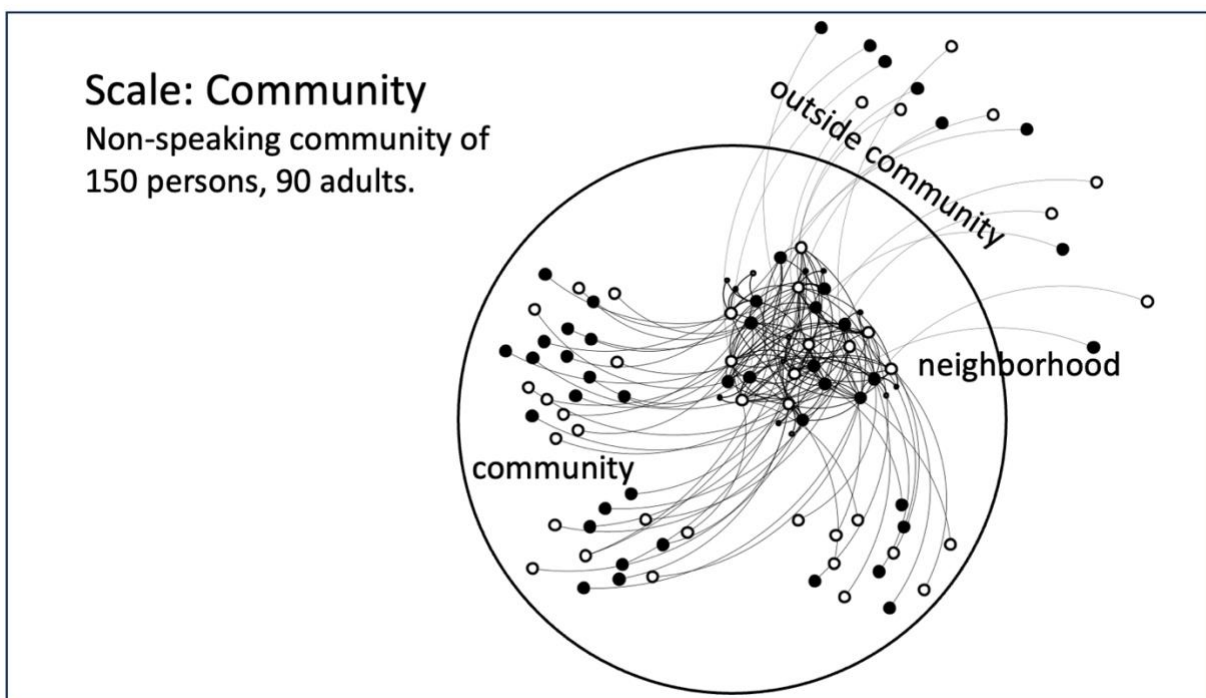


Figure 3. A Community, Showing Links of Members.

of its reliance on links among members as already described, is classified as a network.

The community functioned to guarantee safety against attack from without and to resolve disputes within.

⁷ Even without speech, links for the bonded pair differed from other links, as might be noted in models with variations in weight and orientation of links.

Figure 3 shows a community – indicated by the circle around it. The overall community of 90 adults with nine links each (one of them outside the community) would have a total of 390 links within the community and 90 links outside the community.⁸ The figure highlights a neighborhood within the community, with 7 of the community's 28 households, and indicating links within the neighborhood and its links with other parts of the community and beyond. For the neighborhood, with 24 adults and 13 children, it is assumed that adult links are allocated with six links divided among the household and the local neighborhood, two links to other parts of the home community, and one link to a person outside the community.⁹ Each pair-bonded household was a small network, within larger networks.

Syntactic Language: two stages of institutional growth. Syntactic language arguably arose within a community subgroup; it gradually expanded to the community as a whole. As I have hypothesized, the community subgroup began with about 15 children aged 10 to 14, who met regularly for games that led to expanded verbal communication and then to full- scale syntactic language.¹⁰ The process is modeled here at three points in time, among youths in the years of their greatest facility in learning language.

⁸ The total number of links within the community is $90 \times 8 = 720$; 60 of them are one-way links to children and 330 are two-way links to adults ($660/2 = 330$), giving a total of 390 links within the community and 90 beyond.

⁹ Adults then had slightly more links with their household than with the rest of their neighborhood.

¹⁰ I have used demographic conventions of five-year cohorts in this analysis. Manning 2023a.

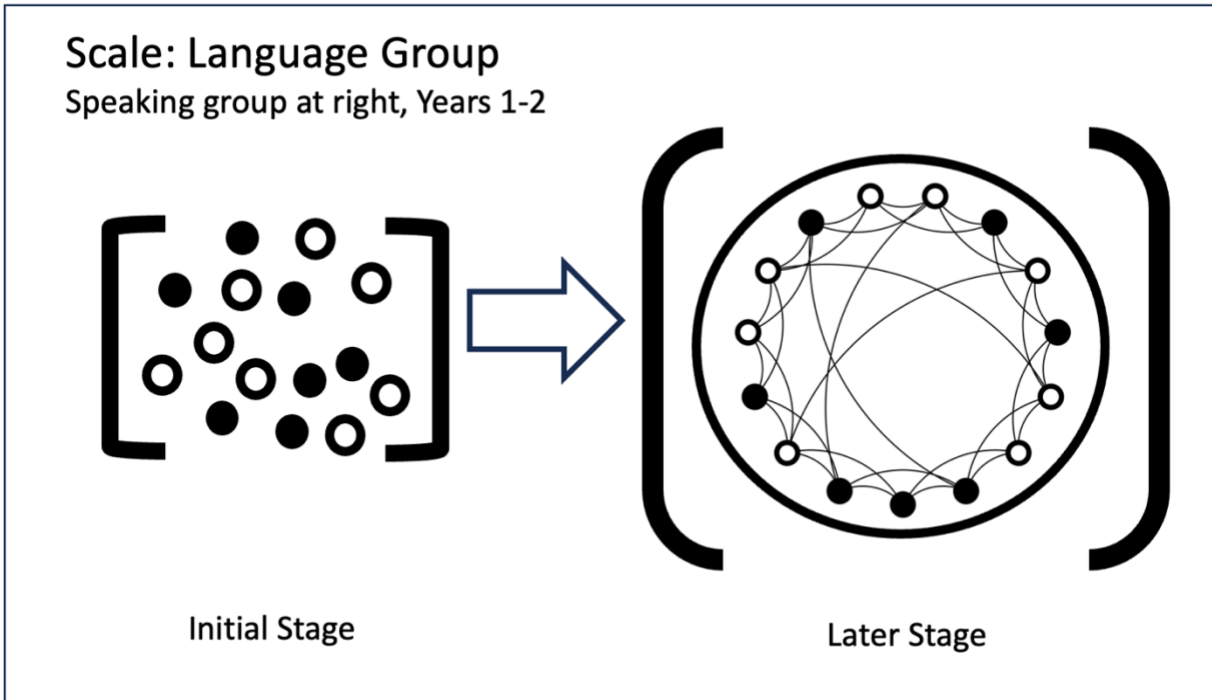


Figure 4. Language Group and Network, Years 1-2.

Figure 4 shows, first, the gathering of an informal group (I-group) – in brackets [] – of young people aged 10-14, whose regular meetings for play developed tight links among them: the nodes are shown arbitrarily within a two-dimensional space. The second image in Figure 4 shows that, after a year or so, the informal group had coalesced into a small network – indicated in parentheses (). The initial nodes were now reassembled into a circular lattice. The lattice linked each node to the two closest nodes but also developed random links that improved communication throughout the group. Once syntax began to take form and speakers were communicating in detail with each other, the language group could be classified as a *network*. Out of innovative play in the network arose the common purpose of developing verbal communication, reflected in forming of new links.

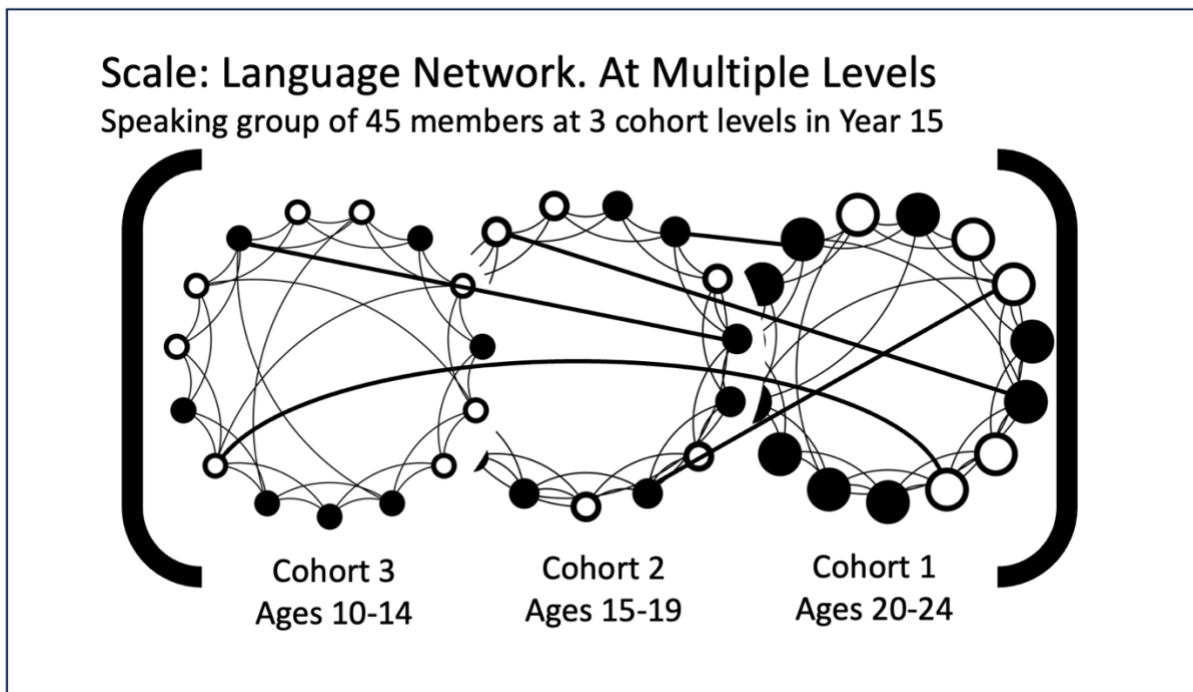


Figure 5. Year 15: Multi-level Language Network.

Figure 5 shows the addition of two more cohorts of 15 young people after each interval of 5 years. During years 11-15, the network of speakers expanded to form a *multilayer network* of three cohorts – indicated as a network by parentheses () – and known as a *We-group* in the terminology of Tuomela.¹¹ The three cohorts include the speaking population of 45 out of the total community population of 150. Through persistent play in vocalization and developing syntax and vocabulary, the speakers made individual and collective agreements to form a *We-group* with the purpose of sustaining what had become the *institution* of spoken language.¹² Formation of the institution required not just this commitment but also had required two years of study by individuals until each of the

¹¹ Tuomela 2013

¹² Tuomela 2013; Manning 2020, 166–167.

apprentice speakers had reached a level that we can call that of a *journeyman*. After year 10 of the process, those in the first cohort had become adults who could form pair-bonded households, led by a speaking mother and father. As their children reached age 2, it was possible for parents to begin introducing spoken language to their toddlers.¹³ As an additional possibility at this stage, it may be that links among speaking adults became stronger or more efficient than links among non-speaking adults. This possibility is not modeled here, but will be considered in future analysis.

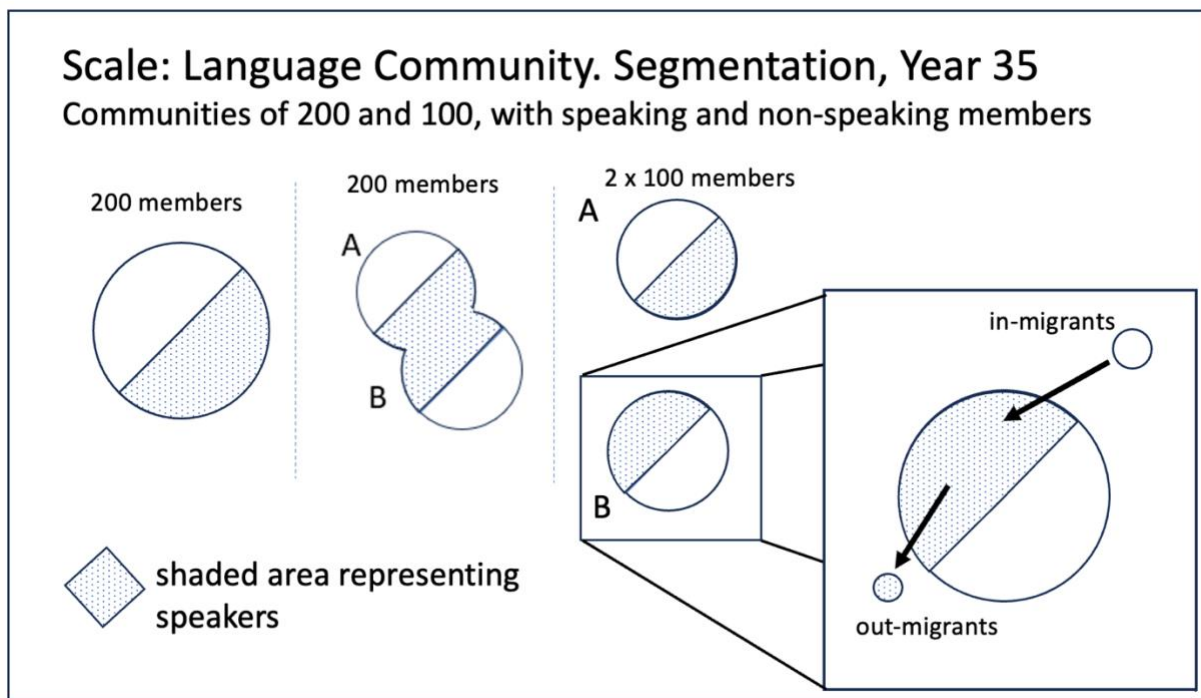


Figure 6. Language Community

Figure 6 shows the speaking community once the language group had developed the characteristics of a *system* with a clear purpose, input, and output. Once the

¹³ A further issue that has not yet been developed is that links among speaking people in this network may be qualitatively different from the links among non-speaking people, deepening communication.

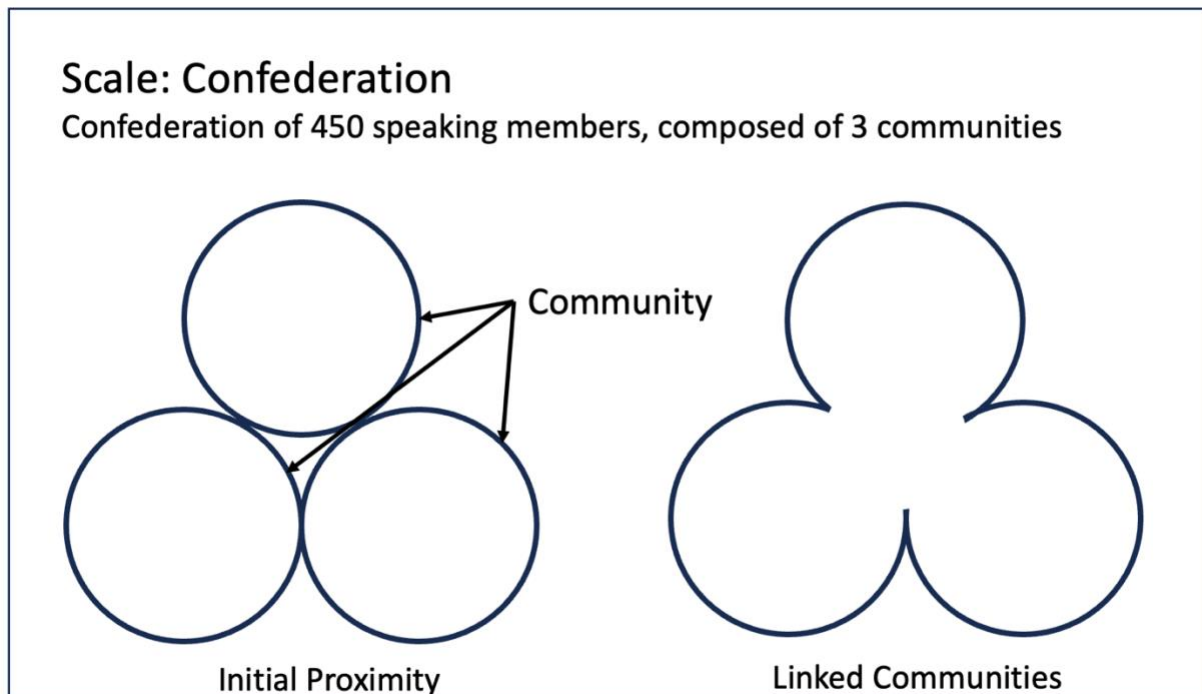
community reached the size of about 200 total members (of whom 100 had already become speakers), it split into two segments (A and B), because it had exceeded the maximum in social and material resources for sustaining a community. Dynamics were similar for A and B but they are shown only for B. Processes of in-migration and out-migration added dynamics that enabled spoken language to expand. Most demographically significant was the in-migration to B of non-speaking youths from other communities who were attracted by the excitement of spoken language. For output from B, small numbers of speaking out-migrants settled in other communities and launched new speaking colonies among youths. Segmentation and the formation of a pair of communities required that some links within the previously unified community be relabeled or reallocated, becoming links across communities. Each new community continued to innovate, leading to divergent languages after a time.

This process of growth and segmentation of speaking communities is assumed to have continued for thousands of years, creating and spreading speaking communities throughout Africa and the world.¹⁴ One assumes that humans throughout Africa had a biological capability to learn speech once the social organization of learning was provided. The experience of inventing or learning language required years of close-knit community interaction to assemble the elements of language, years of individual study by each participating individual, and the creation of norms and social graces for agreeing on how to share language. The pre-existing community network was therefore transformed by stages

¹⁴ If language communities of 150 were to continue periodic splits, a sequence of 12 splits would yield over 4000 speaking communities and total population of over a half million.

into a more tightly organized social institution – a *language community*, governed by consensus on the matter of speaking. As noted, this model of language and its spread involved a great deal of migration.¹⁵

Expanding scale of the human order. As of 30,000 years ago, one must imagine a world of 150-member speaking communities, their institutions and networked behavior. There had been 40,000 years for communities and languages to solidify and maintain connections. In the following years, an impulse to combine and expand community size took hold. Yet as this study of expanding human scale opens, one must note two unanswered questions: What factors previously limited communities to 150? What factors enabled the limits to be overcome?



¹⁵ Manning 2023a.

Figure 7. Confederation of three communities.

The analysis draws on anthropological description and theses on reallocation of individual links to nodes, but it is emphasized that other hypotheses may be valuable in explaining the expansion in social scale. As a first step, Figure 7 shows how three contiguous communities may have developed a broader unity, a “confederation.” For a confederation to become coherent, more links needed to be created among previously separate communities, for instance to make decisions on the sharing of resources or what language to use for what purposes. These additional within-confederation links (not shown here) needed to be reallocated from other pre-existing links. Confederation membership rose to about 450, an unprecedented size for human groups. Distinctiveness of the constituent communities presumably continued, especially in their distinct languages, at least for some time.

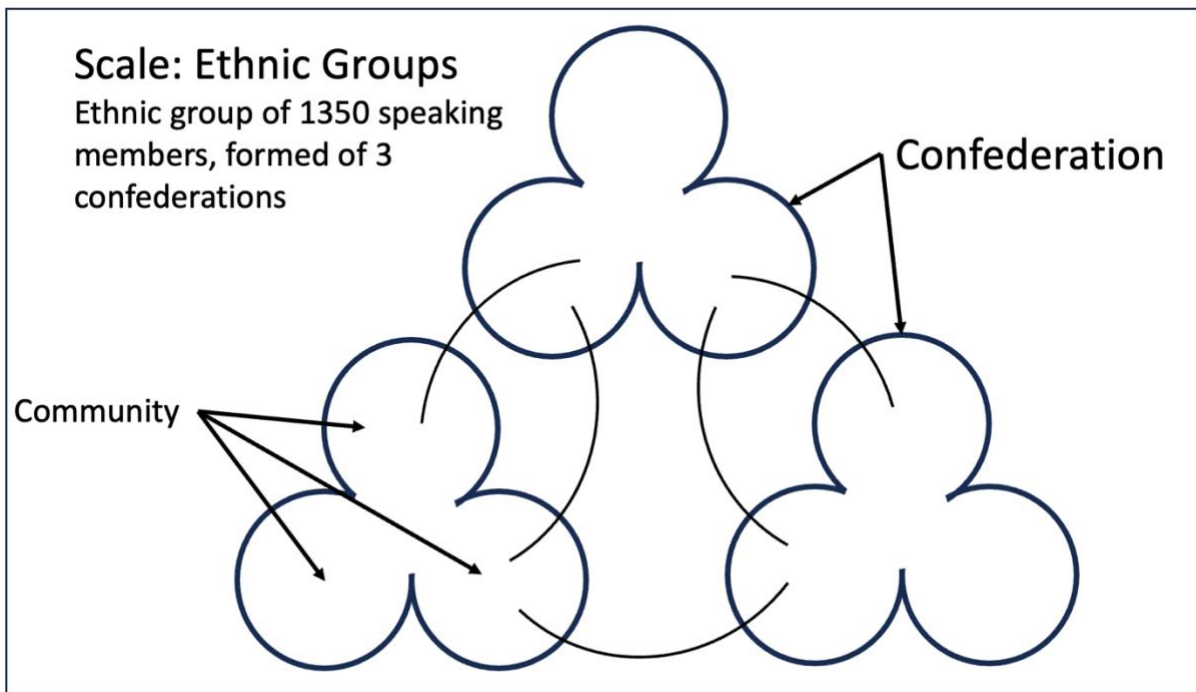


Figure 8. Ethnicity formed from three confederations.

Figure 8 shows the later creation of an “ethnicity” through the assembly of three confederations. Membership rose to about 1500, again exceeding the size of all previous human groups. The illustration shows the potentially fractal configuration and dynamic. It shows the formation of additional links among newly joined units, in parallel to the lower-scale processes of reorienting links among individuals, which strengthened ties within the expanded ethnic groups. It is notable that, in the ethnography of the present day, ethnic groups known as hunter-gatherers or foragers commonly have a membership of 1500. But this narrative suggests that, for foraging peoples, a dramatic shift in their social organization took place, perhaps between 20,000 and 10,000 years ago, in which the size of their social group rose by a factor of ten.

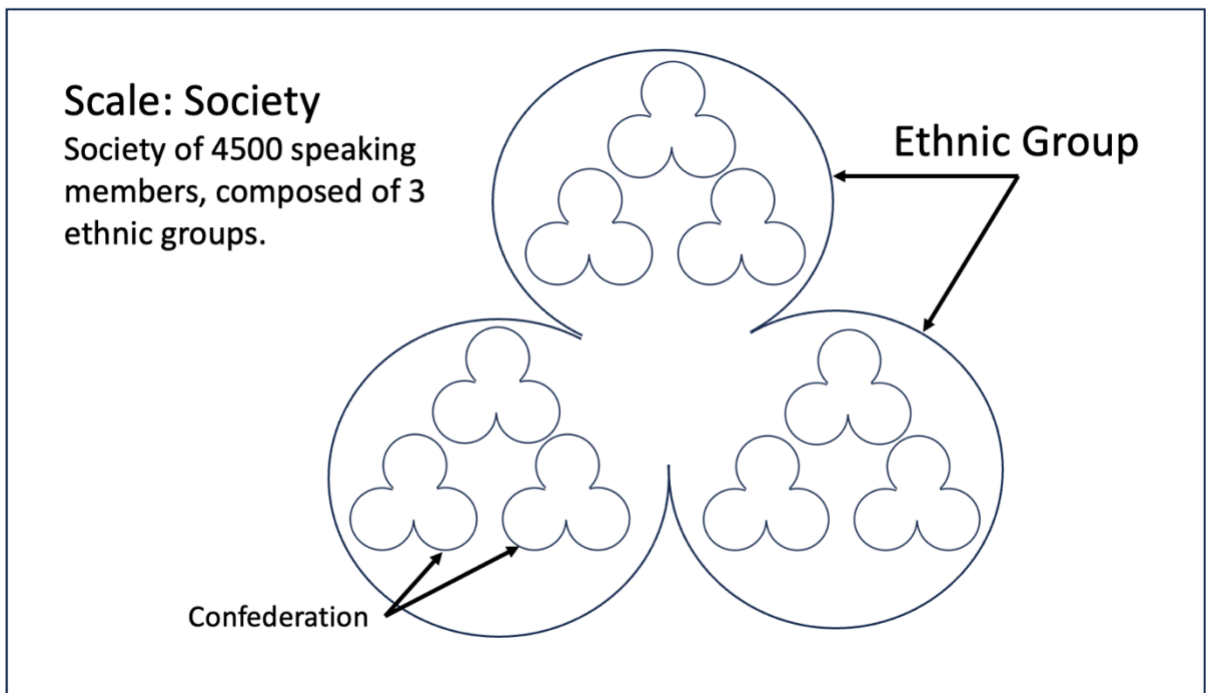


Figure 9. Society formed from three Ethnicities.

Figure 9 shows a further step in fractal expansion: the assemblage of three ethnic groups into a society, with membership rising to 4500, and with the recurring and larger-scale episode of reorienting links to sustain the new structure and the decisions on what languages to use in various situations. Societies of this size are known in the archaeological record after 10,000 years ago.

These descriptions of initial steps in social group expansion draw on network thinking, but leave many questions unanswered, so that neither a network nor a systems framework is yet sufficient to explain these expansions in scale or the many more to follow. So one must label the process of expanding social scale as *unclassified* in group behavior until a sharper and more causal explanation of the process and timing of expansion can be advanced. It is possible that speech communication overcame previous limits, perhaps by changing the nature of links among individuals. Other hypotheses can be applied to this issue, separately and in combination. Potential sources of hypotheses on the expansion of social scale include anthropological narratives of competing traditions of ritual; the role of fractals; phase transitions in society that are analogous to physical phase transitions; and combinations of genetic and epigenetic change.¹⁶

¹⁶ Whitehouse 2022, Dunbar 2020, Levy 2005, Tattersall 2022.